



SLOVENSKI STANDARD

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Zemeljska dela - Geotehnični laboratorijski preskusi - 3. del: Metilen modro vrednost VBS zemljin in kamnin

Earthworks - Geotechnical laboratory tests - Part 3: Methylene blue value VBS on soils and rocks

Erdarbeiten - Geotechnische Laborversuche - Teil 3: Methylenblauwert VBS an Boden und Fels

Terrassements - Essais géotechniques en laboratoire - Partie 3 : Valeur de bleu de méthylène VBS d'un sol ou d'une roche

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93.020	Zemeljska dela. Izkopavanja. Gradnja temeljev. Dela pod zemljo	Earthworks. Excavations. Foundation construction. Underground works
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EUROPEAN STANDARD

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Earthworks - Geotechnical laboratory tests - Part 3: Methylene blue value VBS on soils and rocks

Terrassements - Essais géotechniques en laboratoire -
Partie 3 : Valeur de bleu de méthylène VBS d'un sol ou
d'une roche

Erdarbeiten - Geotechnische Laborversuche - Teil 3:
Methylenblauwert VBS an Boden und Fels

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 17542-3:2022) has been prepared by Technical Committee CEN/TC 396 “Earthworks”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2022, and conflicting national standards shall be withdrawn at the latest by December 2022.

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Introduction

The Methylene blue value V_{BS} on soils and rocks is an identification parameter adopted in the classification of materials for earthworks according to EN 16907-2. It is also used for providing some specifications for construction procedures according to EN 16907-3.

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1 Scope

This document describes the reference method for the determination of the methylene blue value (V_{BS}) in soils and rocks for earthworks.

The test is based on measuring the quantity of methylene blue that can be adsorbed by the material suspended in water. This quantity of adsorbed methylene blue is reported by direct proportionality to the 0/50 mm ground. The soil blue value is directly related to the specific surface area of the soil particles or rocky material.

NOTE The V_{BS} test uses common equipment and calibration as the methylene blue test MB for aggregates (EN 933-9), but it applies to another granular fraction (5 mm for V_{BS} and 2 mm for MB, respectively). Thus, the results obtained between the two tests cannot be compared in the general case.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 17892-1, *Geotechnical investigation and testing - Laboratory testing of soil - Part 1: Determination of water content (ISO 17892-1)*

EN ISO 17892-4, *Geotechnical investigation and testing - Laboratory testing of soil - Part 4: Determination of particle size distribution (ISO 17892-4)*

EN ISO 835, *Laboratory glassware - Graduated pipettes (ISO 835)*

EN ISO 385, *Laboratory glassware - Burettes (ISO 385)*

EN ISO 3819, *Laboratory glassware - Beakers (ISO 3819)*

EN ISO 1042, *Laboratory glassware - One-mark volumetric flasks (ISO 1042)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

subsample

sample obtained by means of a sample reduction procedure

3.2

test portion

sample used as a whole in a single test

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3.3

particle fraction

mass percentage of particles in a range of particle sizes with defined lower and upper diameters referring to the total mass of particles in a soil volume or sample

EXAMPLES Sand fraction: mass percentage of particles with particle sizes between 0,063 mm and 2,0 mm

3.4

constant mass

successive weightings after drying at least 1h apart not differing by more than 0,1 %

3.5

maximum dimension D_{max}

maximum dimension of the largest elements contained in the soil

4 Principle of the test

Increments of a solution of methylene blue are added successively to a suspension of the test portion in water. The adsorption of the dye solution by test portion is checked after each addition of solution by carrying out a stain test on filter paper to detect the presence of free dye (dyes are the methylene blue particles here).

When the presence of free dye is confirmed, the methylene blue value is calculated and expressed as grams of dye adsorbed per 100 g of the 0/50 mm fraction tested.

5 Apparatus

5.1 Burette or pipette, conforming to EN ISO 385 or EN ISO 835, respectively: a dosing device to inject volumes of methylen blue solution in steps of 10 ml, 5 ml and 2 ml and to know the total quantity injected at ± 1 ml.

5.2 White Filter paper, surface mass (95 ± 5) g/m², for quantitative analysis and ash-free ($<0,010$ %); thickness $(0,20 \pm 0,02)$ mm; filtration speed (75 ± 10) s; pore size (8 ± 5) μ m.

5.3 Glass rod, length 300 mm; diameter (8 ± 1) mm.

5.4 Impeller agitator: having a rotational speed covering at least the range of (400 ± 40) r/min to (600 ± 60) r/min.with three or four impeller blades of (75 ± 5) mm diameter.

5.5 Balance, with a maximum permissible measurement error less than 0,2 % of the weighed mass.

5.6 Stopwatch or stopclock, readable to 1 s.

5.7 Test sieves, 63 μ m, 50 mm and 5 mm aperture, with guard sieve (if necessary).

An alternative size fraction is given in Annex B for the preparation of the test sample. Testing other size fractions may produce results different from those obtained using the reference size fractions. The size fraction used and the reference to Annex B should then be given in the test report.

5.8 Beaker, conforming to EN ISO 3819, glass or plastic, capacity 3 000 ml minimum and internal diameter (155 ± 10) mm.

5.9 Flask, class A conforming to EN ISO 1042, glass, capacity 1 000 ml.

5.10 Ventilated oven, thermostatically controlled to maintain a temperature of (100 ± 5) °C.

5.11 Thermometer, readable to 1 °C.

5.12 Spatula.

5.13 Desiccator.

5.14 Closed storage tainted glass bottle, capacity 1 000 ml.

6 Reagents

6.1 Dye solution

Solution of standard or technical quality methylene blue, (10,0 ± 0,1) g/l.

6.2 Preparation of 10 g/l methylene blue solution

6.2.1 Use methylene blue; (C₁₆H₁₈ClN₃S, nH₂O (*n* = 2 to 3) purity ≥ 98,5 %).

6.2.2 Determine the water content w_b of the methylene blue powder as follows:

- weigh approximately 5 g of methylene blue powder and record the mass to the nearest 0,01 g as M_h ;
- dry this powder at (100 ± 5) °C to constant mass, at least 2 h. Cool in the desiccator, and then weigh immediately after taking out of the desiccator. Record the dry mass to the nearest 0,01 g as M_g .

NOTE At temperatures above 105 °C, the chemical structure of the methylene blue powder can be modified.

- calculate and record the water content w_b to the nearest decimal place from the following equation:

$$w_b = (M_h - M_g) / M_g$$

where

M_h is the mass of the methylene blue powder, in grams;

M_g is the mass of the dried methylene blue powder, in grams.

The powder used to determine the moisture content shall not be reused.

The water content shall be determined for the preparation of every new batch of dye solution.

6.2.3 Take a mass of methylene blue powder of (10 × (1 + w_b) ± 0,01) g (equivalent to 10 g of dry powder).

6.2.4 Warm 500 ml to 700 ml of distilled or demineralized water in a beaker. If warm water is used, the temperature shall not exceed 40 °C.

6.2.5 Agitate the contents of the beaker whilst slowly pouring the methylene blue powder into the water, until complete dissolution of the powder.

6.2.6 Make sure that the flask of capacity (1 000 ± 5) ml and the water are at a temperature of (20 ± 1) °C to conform with the calibration of the flask. Pour the solution into the flask, rinsing with distilled or demineralized water to ensure complete transfer of all dye into the flask and add more distilled or demineralized water to the (1 000 ± 5) ml graduation mark..

6.2.7 Shake the flask to ensure complete dissolution of the powder. Keep the prepared solution in a closed storage bottle (preferably tinted glass) and protected from light.

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6.2.8 The following details shall be marked on the conservation bottle:

- Nature of the content: 10 g/l methylene blue solution;
- Date of preparation;
- Use-by date.

6.2.9 Methylene blue solution shall be stored in a dark place and shall not be used more than 1 month after preparation.

7 Preparation of the test portions

7.1 If D_{\max} is greater than 50 mm

Sample 10 kg of the fraction 0/50 mm, then apply procedure of 7.2.

7.2 If D_{\max} is ranging between 5 mm and 50 mm.

Prepare a mass, m , of wet material such as $m > 200 \times D_{\max}$ (m in grams, D_{\max} in millimetres). Sieve, if necessary by washing, the particle fraction 0/5 mm of the sample.

7.3 Washing procedure for materials > 5 mm

7.3.1 Materials concerned

Materials that after dry sieving visually present a significant amount of elements less than 5 mm glued on the refusal obtained as a result of this sieving.

7.3.2 Step 1 - Brushing

The first step is to perform a dry brushing of the refusal obtained to recover the elements less than 5 mm glued or agglomerated. If at the end of this operation, an important amount of elements smaller than 5 mm persists, it is then necessary to carry out a washing.

7.3.3 Step 2 - Washing

The procedure is:

- soaking the refusal to 5 mm ;
- washing (using a brush, a paintbrush or other non-metallic adapted tool) on a 5 mm sieve, using water as least as possible (if possible without adding water after the soaking phase or a quick rinsing with clean water after washing with the water charged with soaking) ;
- decantation then siphoning (if feasible) ;
- drying at a temperature not exceeding 50 °C. The materials should not be dried completely. The dry residue shall be disaggregated ;
- blend of the 2 fractions 0/5 mm obtained by the initial sieving and the washing operation ;
- homogenization and sampling of the test sample by quartering.